

# Run 8 FCAL Calibrations Overview

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Jan 30, 2009

# Primer

- North + South FCAL
- 90 channels in each arm (10 high x9 wide)
- High and Low gain ADCs (HG and LG)
  - only zero suppressed low gain available for physics data
  - High gain  $\sim 16\times$  Low gain
- LED pulsers new for Run 8
- Calibration goal find GeV/LG for each channel
  - removing channel by channel differences is more important than absolute energy scale

# Method Summary

- An odd dimensional analysis

$$\frac{GeV}{ADC_{DATA\ V}^{LG}} = \frac{GeV}{ADC_{1300V}^{HG}} \times \frac{ADC_{1300V}}{ADC_{DATA\ V}} \times \frac{ADC^{LG}}{ADC^{HG}}$$

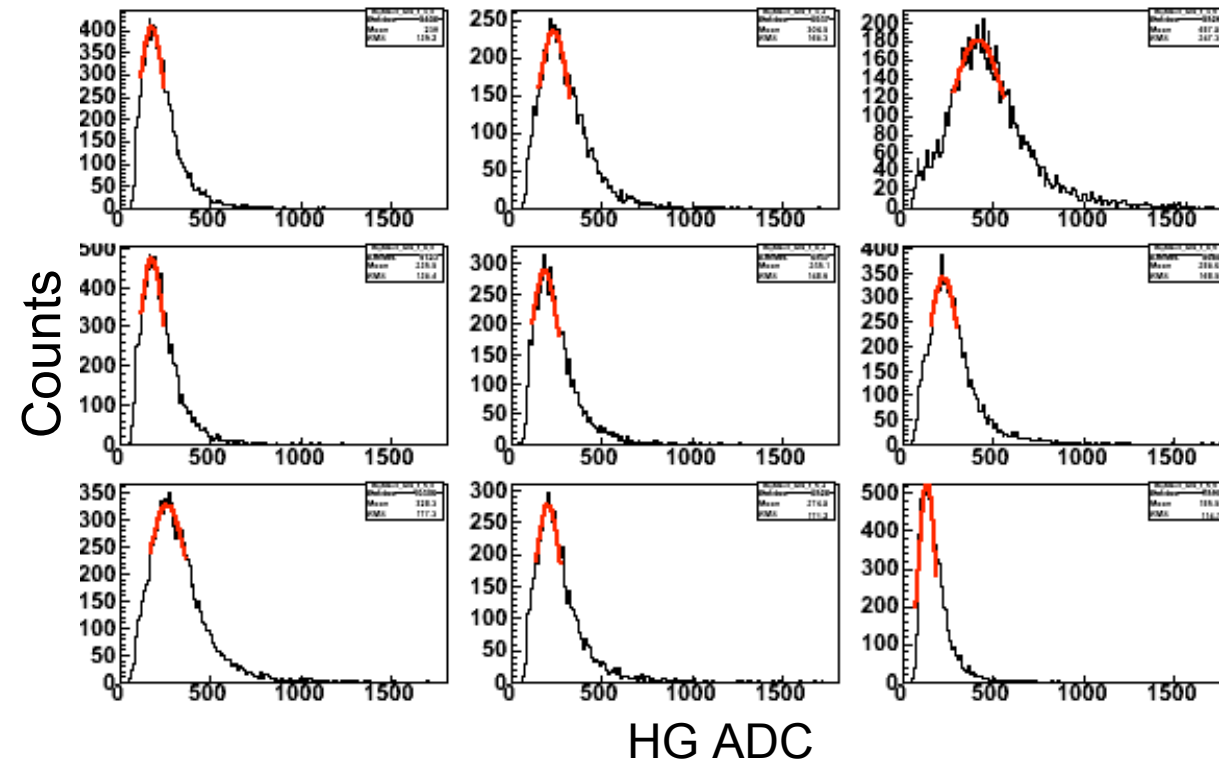
Cosmics
Pulser HV scan
HG Vs LG fit  
HILO factor

**BUT**

- Cosmics have good signal in LG ADC for some channels. Could avoid (at least one) HILOW factor.
- Significant fraction of channels have pulser signal at 1300V and DATA V. Some in same ADC. Avoid fit.
- Could add <HG ADC> to scan fit (when <LG> < 50).
- Is one best off to do method that has fewest factors for each channel, or most generic method for all channels.

# Calibration Step I

- Use self triggered cosmics, assume peak of ADC distribution is know energy value
  - Issue: cosmic data taken at 1300V for good signal. This is much higher than data taking voltage, which varies greatly from inner to outer columns.

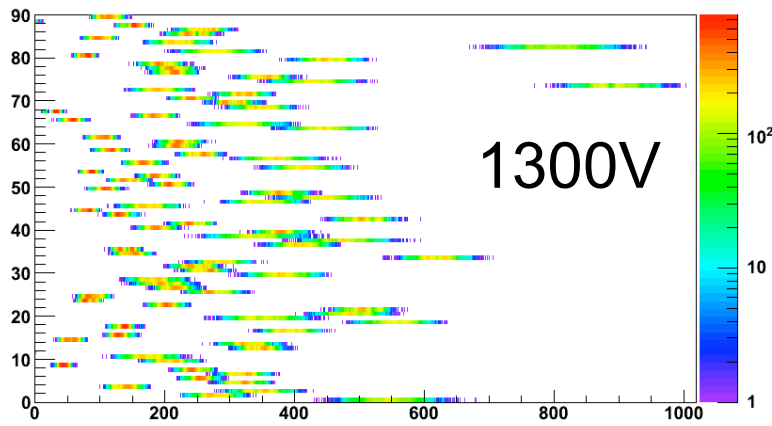


Result:  
 $\text{GeV}/(\text{HG @ 1300V})$

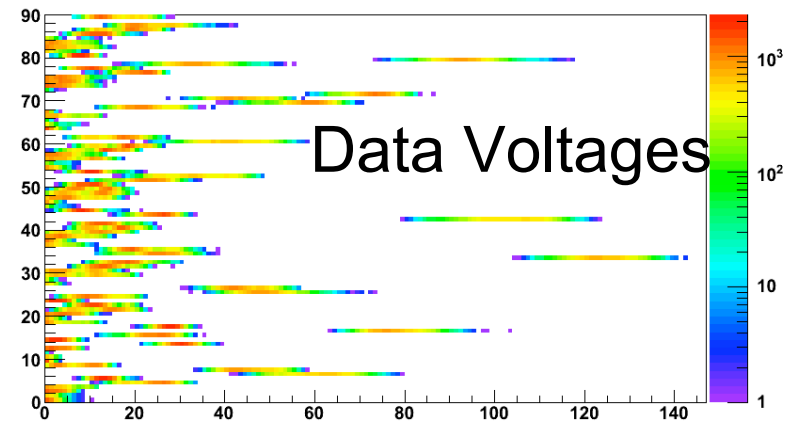
# Calibration Step II

- Use LED pulser data to convert from 1300V to data taking voltage. Result:  $\text{GeV}/(\text{HG} @ \text{Data Voltages})$

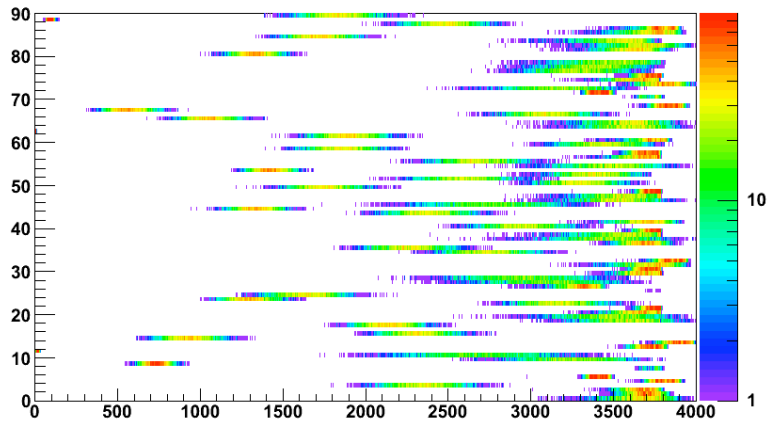
South Low Gain ADC distributions



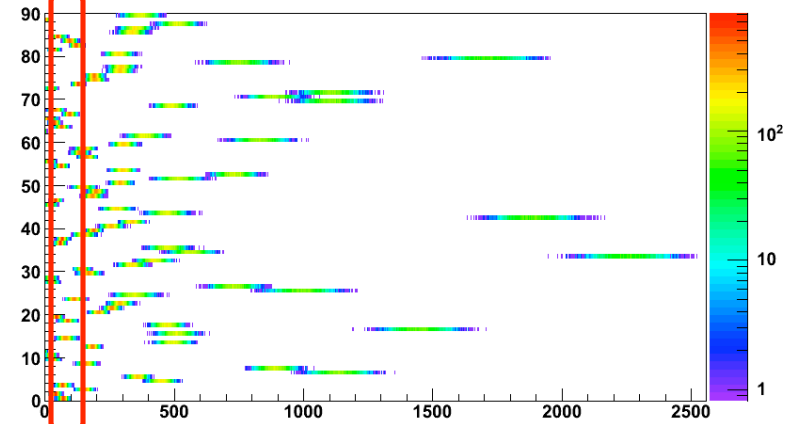
South Low Gain ADC distributions



South High Gain ADC distribution



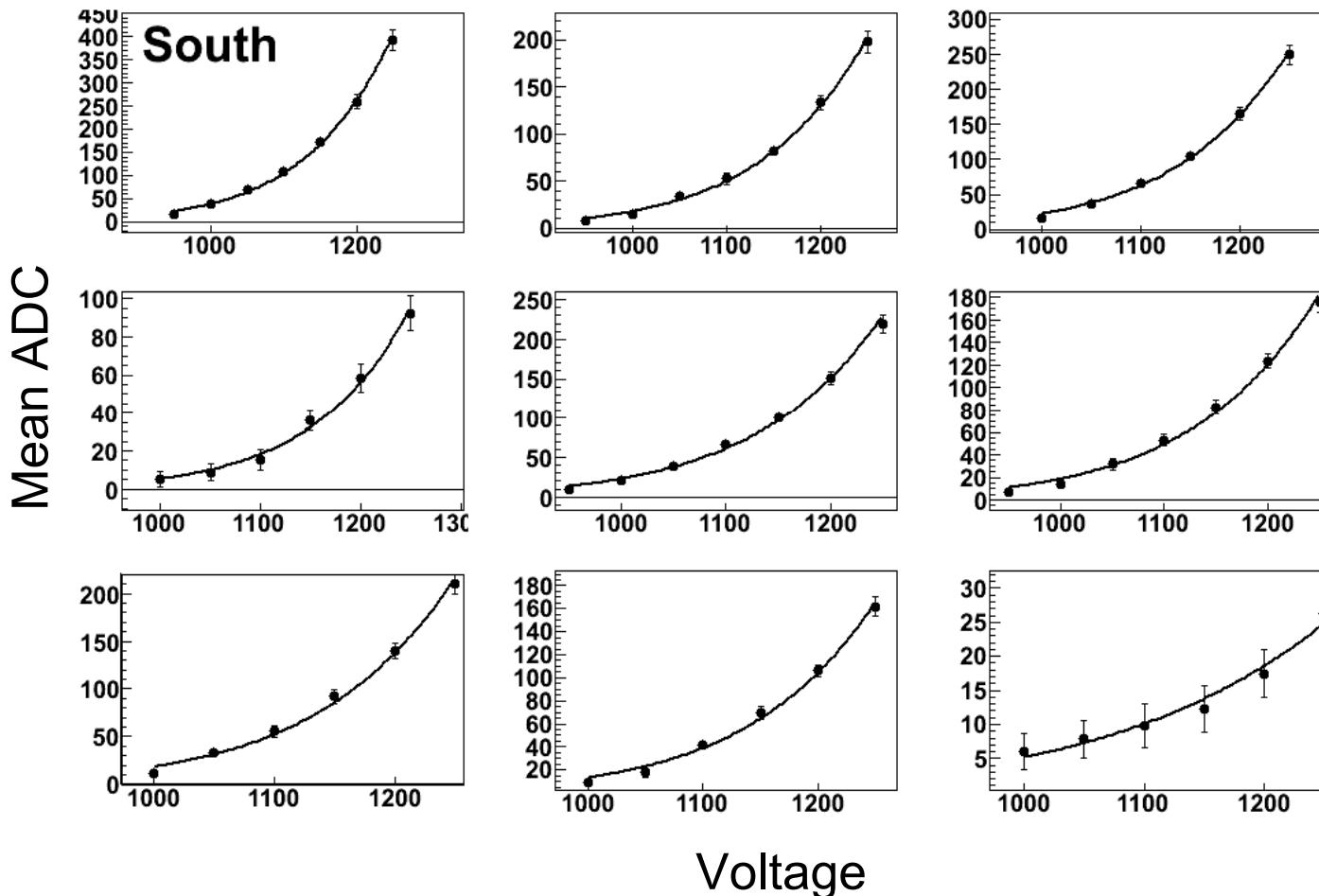
South High Gain ADC distribution



Some channels too low?

# Step II alternative

- Plot mean LG vs voltage and fit with power law. This also allows extrapolation to voltages where there is poor response.

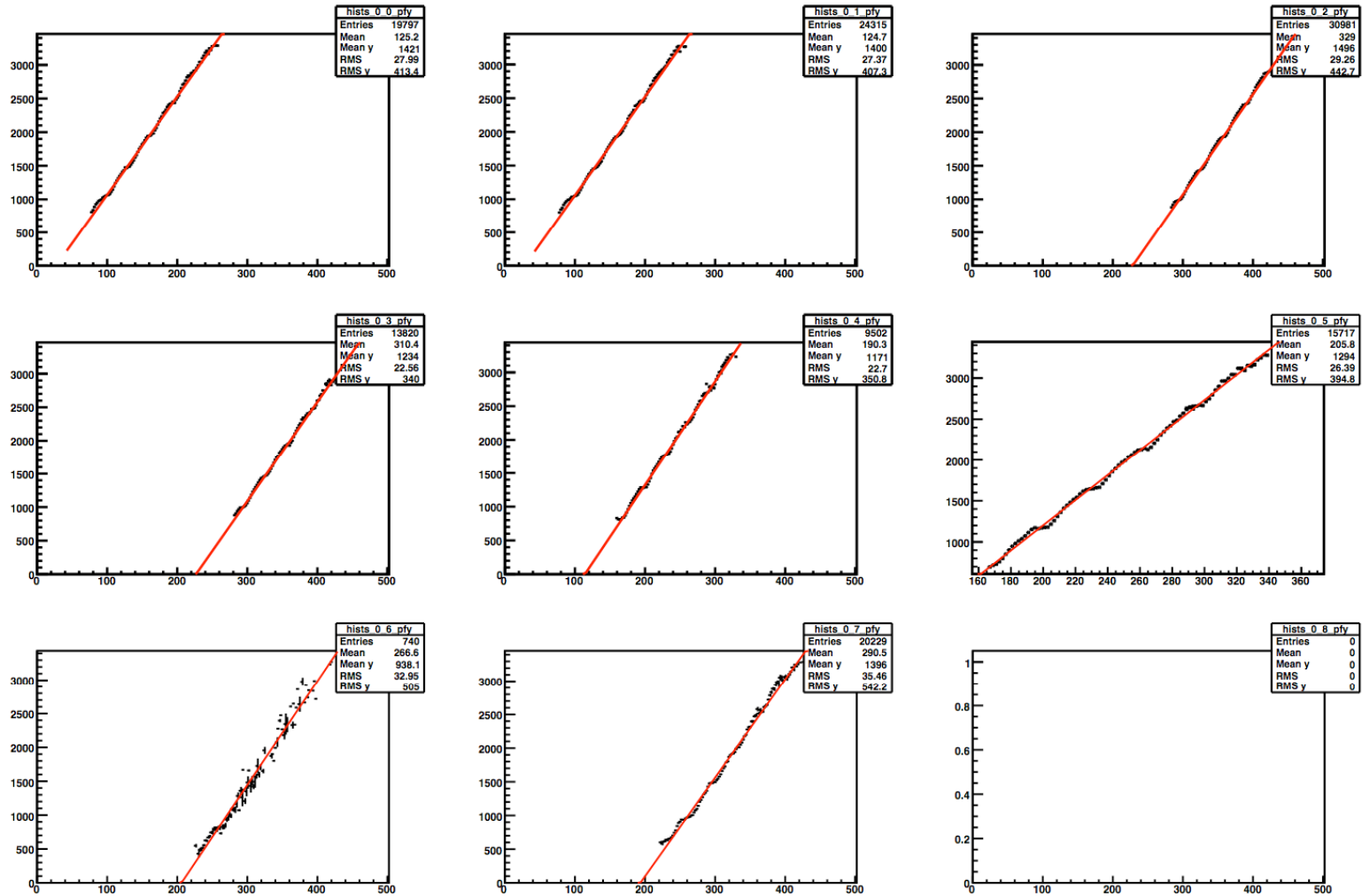


Errors are RMS of ADC distribution. Not really correct.

# Step III

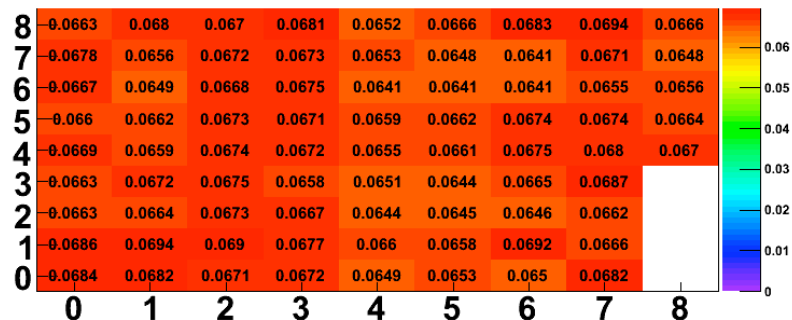
- Convert to LG. Result: LG/HG ratio or HILO factor.  
Fit to line.

High Gain ADC

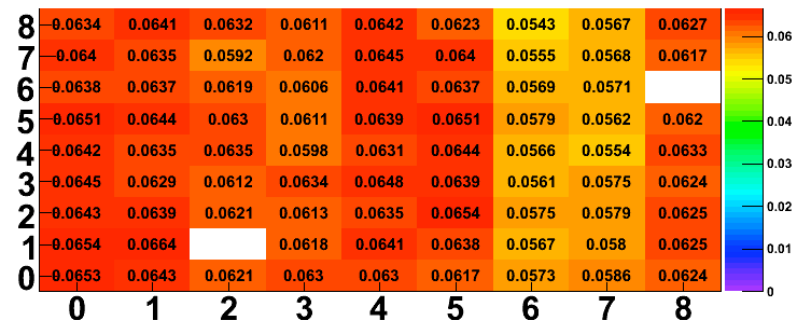


Low Gain ADC

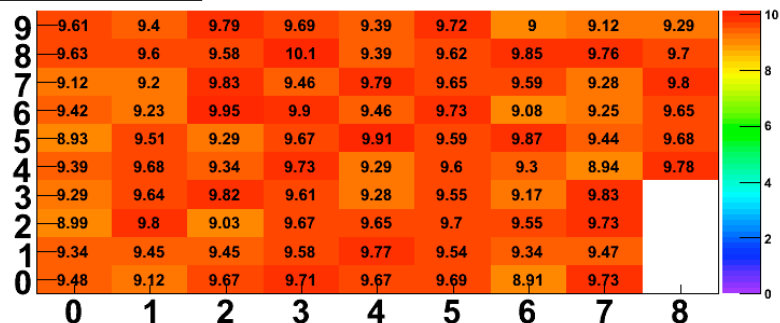
Gain Conversion Factors



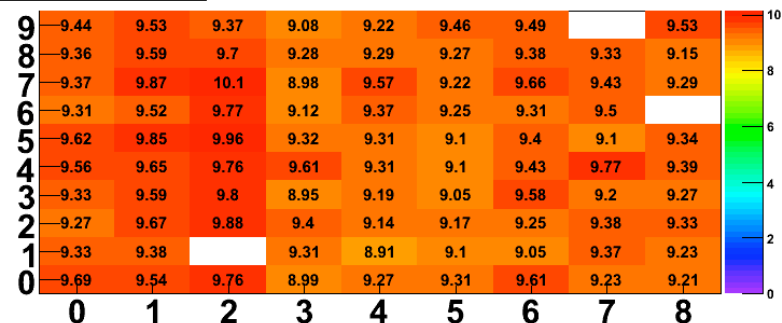
Gain Conversion Factors



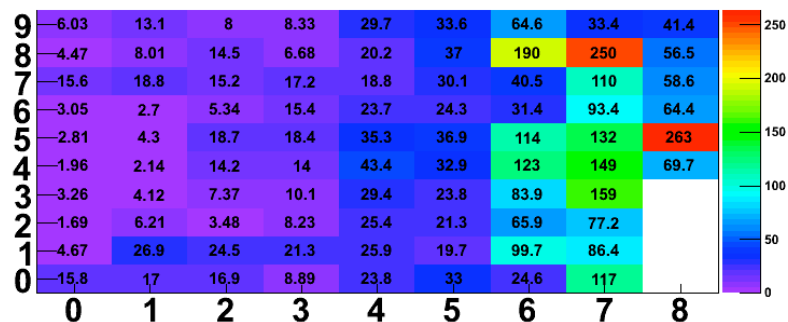
North Power law exponent



South Power law exponent



North LG ADC/GeV



South LG ADC/GeV

